Milpitas Public Library

Appendix iii

Green Building Considerations

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Appendix iii – Green Building Considerations

Within the last ten years, the subject of sustainable building design has emerged as a major concern among architects, engineers and building owners. Many new technologies exist to create high performance civic buildings. These buildings allow cities to create value for their residents and employees by saving energy and providing better indoor working environments.

When designing new building there is an opportunity to layer energy management with all the other design considerations. Bringing controlled daylight into a library, for example, improves the internal environment and also results in electrical energy savings. Many energy management strategies simply involve good practice and do not add cost to the project.

All new buildings in California are required to be designed to meet a baseline standard, Title 24, which addresses the major energy consumption aspects of building—the building envelope, HVAC Systems and lighting systems. However, it is possible to exceed the performance of buildings required by Title 24 by as much as 50%, in order to gain increased savings in operating costs. To achieve these levels the following design process needs to be followed:

- Establish energy performance goals with the client at the beginning of the design process
- Establish a baseline model for power and energy use that meets Title 24, which includes project-operating costs
- Conduct workshop to elecit additional energy saving solutions with the full consultant team, which establishes design strategies and payback analysis
- Incorporate preliminary design solution into a computer model and evaluate the energy impact and cost effectiveness of each strategy by comparing energy use and peak power demand with the title 24 model.
- Determine which strategies to incorporate into the final design
- Rerun the performance simulation for any proposed cost saving during construction or late design phases
- Commission all equipment and controls to provide a training period for the building's engineers; test the building performance in terms of the goals on an annual basis. Retrain engineer's as required.

The options listed in the following pages are based on The California State Library Publication, *ENERGY MANAGEMENT STRATGIES IN PUBLIC LIBRARIES.* This publication summarizes the strategies that have proven to be most productive and also lays out a methodology for calculating the rate of return on different systems.

Determining the energy savings strategies for the Milpitas Library will be pursued in the design phases of the project with the involvement of city staff and city officials in order to determine the appropriate strategies for the Milpitas Library Building.

Building Envelope

1. Provide exterior solar control devices to protect windows and glazing effectively, and to the maximum extent possible, from direct sunlight during the cooling season.
2. Provide interior blinds or shades of appropriate materials to prevent glare conditions within the space when they are used to augment the functional performance of exterior devices.
3. Provide clerestory roof elements to introduce daylight to the interior of the building floor plate. Where possible and where appropriate to the design of reading areas, incorporate openings in the second floor plate to allow daylight from the clerestories to penetrate to the first floor level.
4. Provide operable windows for natural ventilation during certain outside air conditions. Design the air condition control systems to accommodate the natural ventilation-operating mode.
5. Incorporate passive strategies (outside air ventilation, separate exhaust, shading) in an entrance buffer space to allow wider temperature swings and reduced cooling loads.
6. Configure the building floor plate with a primarily southern orientation and minimize the western orientation.
7. For flat roof areas, specify a light-colored roofing membrane or provide the membrane with a white reflective coating ("Cool Roof").
8. Specify high-performance (*Low-e)* insulated glass units in lieu of tinted glass. Consider fritted glass – glass with solid ceramic coating applied in a pattern – for additional shading performance.
9. Install extra insulation beyond California Title 24 basic requirements to the maximum extent possible within practical assembly and structural limitations. Provide details and specifications to ensure a continuous insulation envelope for the building.
10. Minimize absolute area of glazing appropriate to optimizing daylight and access to views.

Lighting Systems

1. All public areas, including reading rooms, stack areas, circulation and reference desks, study areas and lobbies should have lighting automatically controlled by a time clock schedule as part of a building lighting control system.
2. Lighting for individual offices, restrooms, storage rooms, lounges, conference rooms, closets, and any other space not continuously occupied, should be controlled with occupancy sensors.
3. Bi-level switching – controlling lamps in light fixtures separately – should be provided in as many spaces as possible with tandem wiring when feasible. Provide bi-level

switching in spaces that have a zone of day lighting, normally the area within 15 feet of a daylight source.

4. When indirect light fixtures are appropriate, such as in spaces with computer workstations, specify fixtures with a single T5HO lamp instead of fixtures with two T8 lamps.
5. For stack-mounted lighting, specify fixtures using T5HO fluorescent lamps; ensure that the reflectors in these fixtures provide adequate source glare protection.
6. Specify that all exit signs shall have LED lamps.
7. Maximize the use of daylight by specifying continuously dimming electronic ballasts in fixtures within 15 feet of a daylight source. Circuit these fixtures separately from other fixtures that are not within the day lighting zone.
8. Aggressively utilize roof areas for daylight apertures such as roof clerestories and roof monitors.

Heating , Ventilating, and Air Conditioning Systems

1. Specify HVAC equipment with the highest energy efficiency ratings, appropriate to the system and application. Ensure that the equipment capacity matches the lad profile appropriate to application.
2. Match the fan capacity of the unit to the cooling load. Use variable speed fans rather than single speed fans.
3. Specify a VAV system rather than a CAV system. If a CAV system is preferred, do not specify the terminal reheat feature.
4. Avoid the use of VAV Reheat Systems. .
5. Investigate the use of the *Mixed Mode Building System*, utilizing the *Floor Plenum System,* as a basis for the HVAC system design, the electrical system design and the data system design. Investigate the use of a *Chilled Ceiling System,* either separately or in combination with a *Floor Plenum System*
6. l rooftop systems are to be used, utilize a “cool roof” and an open equipment screen to minimize the temperature of the outside air that is introduced into the building air stream at the rooftop unit.
7. Evaluate the use of ice storage systems in the early design phase to determine the feasibility of introducing such systems into the overall HVAC system design.
8. Evaluate the use of heat recovery systems in the early design phase to determine the feasibility of introducing such systems into the overall HVAC system design.
9. Separate the special collection stacks into separately air-conditioned spaces if the temperature set points are lower and the allowable humidity range is smaller than nearby user spaces. Avoid mixing the user spaces with the special collection storage areas if these more stringent air conditions are to be maintained by the systems.
10. If there are program elements that allow spaces with a wider range of temperature variation than the occupied spaces of the library, such as building link spaces or indoor-outdoor spaces, study the utilization of these spaces as *Atrium* spaces.

Electrical Systems

1. Install Load Shedding Control Systems to limit the peak electric demand charges.
2. Specify *Duty Cycling Controllers,* perhaps as part of the Load Shedding Program, to assign certain times when different equipment can be operated in an effort to obtain a fairly constant electrical energy demand.
3. Specify a *Power Factor Correction System* to maintain the highest possible value for the building's Power Factor.
4. Specify motors that have the highest NEMA energy efficiency rating.
5. Specify Variable Frequency Drives (VFD's) in large building motors that operate for long periods of time.
6. Specify Gen2 elevator systems as part of the new building design.
7. Adopt a policy of purchasing only "Energy Star" certified products. Ensure that the "power-down" and "sleep" functions are utilized, and not subject to user meddling.
8. Evaluate the economic payback of installing a photovoltaic system linked to the electric utility grid. Optimize the geometry and installation design of the system to maximize its output and economic feasibility.
9. If a photovoltaic or other on-site electric power generating system is considered because of high rate programs offered by the state or the public utility, utilize a grid-interactive system to help reduce peak power demand.

Service Water Heating

1. Specify Ultra-Efficient Water Heaters in new building design in existing library buildings.
1. Specify automatic shut-off fixtures to limit the amount of hot water used for hand washing.
2. In new library buildings, set the hot water temperature as low as possible for hand-washing applications, and use a local booster heater in staff lounges and café kitchens for dishwashers.
3. Consider solar water heating for service water heating.
4. Evaluate the benefit of utilizing gray water heat recovery systems in new buildings.